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இலங்கைப் பரீட்சைத் திணைக்களம்
Department of Examinations, Sri Lanka

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2021(2022)
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2021(2022)
General Certificate of Education (Adv. Level) Examination, 2021(2022)

ගණිතය I
கணிதம் I
Mathematics I

07 E I

පැය තුනයි
மூன்று மணித்தியாலம்
Three hours

අමතර කියවීම් කාලය - මිනිත්තු 10 යි
மேலதிக வாசிப்பு நேரம் - 10 நிமிடங்கள்
Additional Reading Time - 10 minutes

Use additional reading time to go through the question paper, select the questions you will answer and decide which of them you will prioritise.

Index Number | | | | | | | |

Instructions:

- *This question paper consists of two parts;* **Part A** (Questions **1 – 10**) and **Part B** (Questions **11 – 17**).
- **Part A:** *Answer **all** questions. Write your answers to each question in the space provided. You may use additional sheets if more space is needed.*
- **Part B:** *Answer **five** questions only. Write your answers on the sheets provided.*
- *At the end of the time allotted, tie the answer scripts of the two parts together so that* **Part A** *is on top of* **Part B** *and hand them over to the supervisor.*
- *You are permitted to remove **only** **Part B** of the question paper from the Examination Hall.*

For Examiners' Use only

(07) Mathematics I		
Part	**Question No.**	**Marks**
A	1	
	2	
	3	
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B	11	
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	15	
	16	
	17	
	Total	

Total

In Numbers	
In Words	

Code Numbers

Marking Examiner		
Checked by:	1	
	2	
Supervised by:		

[see page two

Part A

1. Let $A = \{x \in \mathbb{R} : |x + 2| < 4\}$ and $B = \{x \in \mathbb{R} : |x + 1| \geq 5\}$. Find $A \cap B$, $A \cap B'$ and $A' \cup B$.

2. Let A and B be subsets of a universal set S. Show that $A \cup (A \cup B')' = A \cup B$.
Represent the sets $A \cup B$ and $(A \cup B')'$ in two separate Venn diagrams.

[see page three

0414

3. Show that the compound proposition $(p \wedge \sim q) \Rightarrow r$ and the compound proposition $(\sim p \vee q) \vee r$ are logically equivalent.

4. Let $m, n \in \mathbb{Z}$. Using the method of contradiction, prove that if $m(n^2 + 2n)$ is odd, then m and n are both odd.

[*see page four*

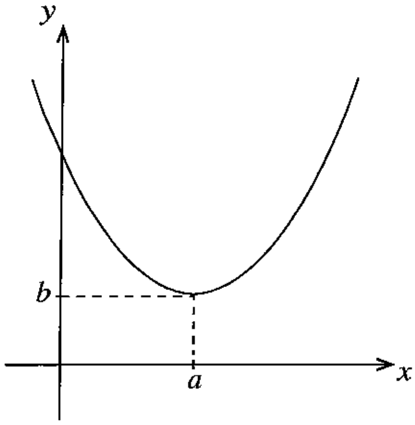
5. Using the change of base formula, show that $\log_{x^2} 4 = \frac{1}{2}\log_x 4$.

Hence, solve the equation $\log_x 4 + \log_{x^2} 4 = 3$ for x.

6. Find all real values of x satisfying the inequality $\frac{x-6}{2-x} \leq x$.

[see page five

7. The graph of $f(x)=2(x-2)^2+3$ is shown in the diagram. Write down the values of a and b, and the range of f.
State the largest value of k for which f has an inverse function on $x \leq k$.
For this value of k, find $f^{-1}(x)$.



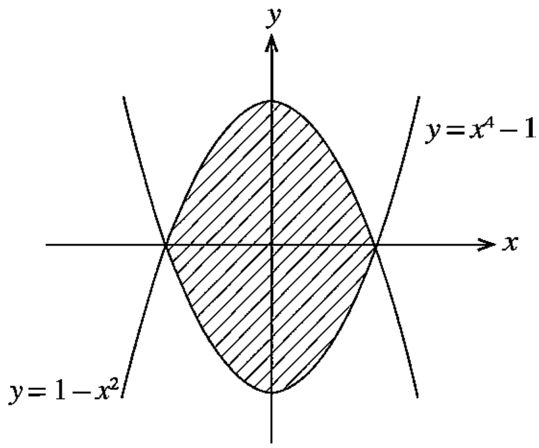
8. Let $A \equiv (3, 6)$ and $B \equiv (-5, 2)$. Find the equation of the perpendicular bisector l of AB.
Find the x–coordinates of the points on l such that the distance from the origin is 1 unit.

[see page six

9. A spherical balloon is expanding. At time t seconds, its radius is r cm. Its volume increases at a constant rate of $2\ \text{cm}^3\,\text{s}^{-1}$. Show that $\frac{\mathrm{d}r}{\mathrm{d}t} = \frac{1}{2\pi r^2}$.

Show also that the surface area of the balloon increases at a rate of $0.5\ \text{cm}^2\,\text{s}^{-1}$ when $r = 8$.

10. Find the area of the region enclosed by the curves $y = x^4 - 1$ and $y = 1 - x^2$.



අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2021(2022)
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2021(2022)
General Certificate of Education (Adv. Level) Examination, 2021(2022)

ගණිතය I
கணிதம் I
Mathematics I

07 E I

Part B

* *Answer five questions only.*

11. (*a*) A player should pass two fitness tests to join a sports club. 120 players faced both fitness tests. It was found that the number of players who passed the first test is three times the number of players who passed both tests and, the number of players who passed the second test is twice the number of players who failed both tests. The number of players who passed only one test is 75.

Find the number of players

(i) who failed both tests.

(ii) who passed both tests.

(iii) who passed the first test.

(*b*) Using truth tables, determine whether each of the following compound propositions is a tautology or a contradiction.

(i) $\sim(p \rightarrow q) \vee (\sim p \vee (p \wedge q))$

(ii) $(p \rightarrow q) \wedge (q \rightarrow r) \wedge (p \wedge \sim r)$

12. (*a*) Using the **Principle of Mathematical Induction**, prove that

$$\sum_{r=1}^{n}\left(6r^2+1\right) = n\left(2n^2+3n+2\right) \text{ for all } n \in \mathbb{Z}^+.$$

(*b*) Let $U_r = \dfrac{3}{(3r-1)(3r+2)}$ for $r \in \mathbb{Z}^+$.

Verify that $U_r = \dfrac{1}{3r-1} - \dfrac{1}{3r+2}$ for $r \in \mathbb{Z}^+$.

Show that $\displaystyle\sum_{r=1}^{n} U_r = \frac{1}{2} - \frac{1}{3n+2}$ for $n \in \mathbb{Z}^+$.

Hence, show that $\displaystyle\sum_{r=1}^{\infty} U_r$ is convergent and find its sum.

Deduce that $\displaystyle\sum_{r=1}^{\infty} U_{r+1} = \frac{1}{5}$.

[See page eight

13. (*a*) Let $k\left(\neq -\frac{1}{2}\right)$ be a real constant.

Show that the quadratic equation $(2k+1)x^2 - 2x - k = 0$ has real distinct roots.

Let $p = 2\alpha + \beta$ and $q = \alpha + 2\beta$, where α and β are the roots of the above equation. Express $p+q$ and pq in terms of k and find the quadratic equation whose roots are p and q.

(*b*) Let $p(x) = x^4 + 5x + a$, where a is a real constant.

If $p(x)$ is divisible by $x^2 - x + 3$, find the value of a and factorize $p(x)$ completely.

Hence, find all real roots of the equation $p(x) = 0$.

14. (*a*) Let $k \in \mathbb{R}$. Find in terms of k, the first 4 terms in the expansion of $(k+x)^8$ in ascending powers of x.

Given that the coefficients of x^2 and x^3 in this expansion are the same, find the value of k.

(*b*) A company earned a profit of Rs. 20 000 000 in the year 2020. The company considered two plans, Plan A and Plan B to increase profits. Under Plan A, the annual profit should increase each year by 5% of its value in the previous year. Under this plan find the total profit for the 10 years from 2020 to 2029.

Under Plan B, the annual profit should increase each year by a constant amount Rs. D. Find the value of D for which the total profit in the 10 years from 2020 to 2029 would be the same for both plans.

15. Let $A \equiv (1, a)$, $B \equiv (-3, b)$ and $M \equiv (c, 1)$, where $a, b, c \in \mathbb{R}$ and M is the mid-point of AB.

Find the value of c and show that the point $C \equiv (a-2, b-1)$ lies on the line l: $x + y + 1 = 0$.

It is given that AB is parallel to l.

Find the values of a and b.

With the above values for a, b and c, find

(i) the coordinates of the point D such that $ABCD$ is a parallelogram,

(ii) the area of the parallelogram $ABCD$.

Let m be the line $2x + y = 3$. Find the equation of the line through the point of intersection of l and m, and perpendicular to BD.

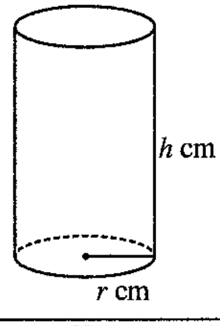
16. (*a*) Evaluate $\lim\limits_{x\to 2} \dfrac{(x^2-4)^3}{(x-2)} \cdot \dfrac{2}{\left(\sqrt{x}-\sqrt{2}\right)^2}$.

(*b*) Differentiate each of the following with respect to x:

(i) $\dfrac{3x^2+1}{x^2+3}$ (ii) $x^8 \ln x + \dfrac{(x+1)}{\ln x}$ (iii) $\sqrt{(e^{2x}+1)^2+1}$

(*c*) A closed cylindrical can that has a volume of 128π cm^3 needs to be constructed. Let its radius be r cm and the height be h cm as shown in the figure. Show that the total surface area S cm^2 of the can is given by $S = 2\pi\left(r^2 + \dfrac{128}{r}\right)$ for $r > 0$.

Find the value of r that minimizes S.



[See page nine

17. (*a*) Using the method of **partial fractions**, find $\int \frac{1}{(x-1)(x-2)^2}\,dx$.

(*b*) Using the method of **integration by parts**, find $\int x\left(e^x + 2e^{2x}\right)dx$.

(*c*) The following table gives the values of the function $f(x) = xe^{x^2}$, correct to three decimal places, for values of x between 0 and 1 at intervals of length 0.25.

x	0	0.25	0.5	0.75	1
$f(x)$	0	0.266	0.642	1.316	2.718

Using **Simpson's rule**, find an approximate value for $I = \int_0^1 xe^{x^2}\,dx$.

Hence, find an approximate value for e.

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இலங்கைப் பரீட்சைத் திணைக்களம்
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අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2021(2022)
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2021(2022)
General Certificate of Education (Adv. Level) Examination, 2021(2022)

ගණිතය II
கணிதம் II
Mathematics II

07 E II

පැය තුනයි
மூன்று மணித்தியாலம்
Three hours

අමතර කියවීම් කාලය - මිනිත්තු 10 යි
மேலதிக வாசிப்பு நேரம் - 10 நிமிடங்கள்
Additional Reading Time - 10 minutes

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Index Number | | | | | | | |

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- *You are permitted to remove **only*** **Part B** *of the question paper from the Examination Hall.*
- *Statistical tables will be provided.*

For Examiners' Use only

(07) Mathematics II		
Part	**Question No.**	**Marks**
A	1	
	2	
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	5	
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B	11	
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	17	
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In Numbers	
In Words	

Code Numbers

Marking Examiner		
Checked by:	1	
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Supervised by:		

[*see page two*

Part A

1. Show that

$$\begin{vmatrix} a^2 & b^2 & b^2+ab \\ a^2+ab & b^2 & ab \\ ab & 2b^2 & b^2 \end{vmatrix} = 4a^2b^4, \text{ where } a, b \in \mathbb{R}.$$

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2. Let $\mathbf{A}=\begin{pmatrix} 2 & 1 \\ 1 & 0 \end{pmatrix}$, $\mathbf{B}=\begin{pmatrix} 3 & -1 \\ 4 & 2 \end{pmatrix}$ and $\mathbf{C}=\begin{pmatrix} 1 & 3 \\ 0 & 5 \end{pmatrix}$. Find $\mathbf{AB}$ and $\mathbf{A(2B-C)}$.

Verify that $\mathbf{2AB-AC=A(2B-C)}$.

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[see page three

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3. Daily rainfall measurements of 5 days were observed. The sum and the sum of squares of these measurements are 45 ml and 650 ml^2 respectively. Find the mean and standard deviation of the rainfall measurements.
The daily rainfall measurements of the next two days were also observed and those values are 10 ml and 8 ml. Find the new value of the mean.

4. A book that has 200 pages contains 20 printing mistakes and these mistakes are randomly distributed. The number of mistakes per page has a Poisson distribution. Find the probability that 10 pages selected at random have only one mistake.

[see page four

5. The monthly salaries, in thousand rupees, of employees of a company are normally distributed with a mean of 80 and a standard deviation of 25. The company provides free transport to the employees who are in the lowest 10% of the salaries. Find the highest salary earned by the employees who are eligible for free transport.

6. A survey report states that 15% of a certain type of remote controller stops working within the first year of its manufacturing. If 5 remote controllers of that type are selected at random, find the probability that

(i) 3 of them stop working within the first year,

(ii) more than 2 of them stop working within the first year.

[see page five

7. The probabilities that a person gets the first and the second job he applied for are 0.5 and 0.3 respectively. The probability that he gets both jobs he applied for is 0.4. Find the probability,

(i) that he gets at least one of the jobs he applied for,

(ii) that he gets the second job he applied for, provided that he got the first job he applied for.

8. Let A and B be two events of a sample space S such that $P(A)=\frac{1}{4}$, $P(A'\cap B)=\frac{1}{2}$ and $P(B\mid A)=\frac{4}{5}$.
Find (i) $P(A\cup B)$, (ii) $P(A\cap B)$ and (iii) $P(B)$.

[see page six

9. According to past records, the probability distribution of the number of students X who are late for a class is given below:

k	0	1	2	3	4
$P(X=k)$	p	0.3	$3p$	0.2	p

Find the value of the constant p and show that $E(X) = 1.9$.

Let Y be the random variable given by $2X+3$. Find $E(Y)$.

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10. A continuous random variable X has probability density function $f(x)$ given by

$$f(x)=\begin{cases} 2ax-3bx^2 & , \text{ for } 0 \le x \le 1, \\ 0 & , \text{ otherwise,} \end{cases}$$

where a and b are constants.

It is given that $E(X^2)=\frac{1}{4}$. Find the values of a and b.

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இலங்கைப் பரீட்சைத் திணைக்களம்
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අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2021(2022)
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General Certificate of Education (Adv. Level) Examination, 2021(2022)

ගණිතය II
கணிதம் II
Mathematics II

07 E II

Part B

* *Answer five questions only.*

11. A supermarket makes three types of hampers: basic, standard and luxury.

Every basic hamper has 6 packets, 9 bottles and 6 tins.

Every standard hamper has 9 packets, 6 bottles and 8 tins.

Every luxury hamper has 9 packets, 9 bottles and 10 tins.

Each day, the supermarket must use at least 720 packets and at least 720 bottles whilst the maximum number of tins that can be used is at most 900.

On a particular day, the supermarket packs an equal number of standard hampers and luxury hampers.

If the supermarket makes a profit of Rs. 100, Rs. 200 and Rs. 500 from each basic, standard and luxury hamper and wishes to maximize the total profit.

(i) Formulate this as a linear programming problem.

(ii) Sketch the feasible region.

(iii) Using the graphical method, find the solution of the problem formulated in part (i) above.

12. (*a*) Let $\mathbf{A} = \begin{pmatrix} a & 0 & 2 \\ 2 & b & 0 \end{pmatrix}$.

Find $\mathbf{AA^T}$ in terms of a and b.

Show that if $\mathbf{AA^T} = \begin{pmatrix} 5 & 2 \\ 2 & 8 \end{pmatrix}$, then $a = 1$ and $b = 2$.

Let $\mathbf{C} = \mathbf{AA^T} - 8\mathbf{I}$. Find $\mathbf{C^{-1}}$.

Find the matrix $\mathbf{D}$ such that $\mathbf{CD} = 8\mathbf{C} + \mathbf{I}$, where $\mathbf{I}$ is the identity matrix of order 2.

[*See page eight*

(*b*) Let $a, b \in \mathbb{R}$. Write the pair of simultaneous equations

$$ax + (b-1)y = 2$$
$$x - y = -4$$

in the form $\mathbf{PX} = \mathbf{Q}$, where $\mathbf{X} = \begin{pmatrix} x \\ y \end{pmatrix}$, and $\mathbf{P}$ and $\mathbf{Q}$ are matrices to be determined.

It is given that $\mathbf{X} = \begin{pmatrix} -2 \\ 2 \end{pmatrix}$ is a solution of $\mathbf{PX} = \mathbf{Q}$. Show that $b = a + 2$.

Show that the above pair of equations has

(i) a unique solution when $a \neq -\frac{1}{2}$

(ii) infinitely many solutions when $a = -\frac{1}{2}$

13. (*a*) Two unbiased coins and an unbiased cubic die were tossed. Let A be the event of getting heads on both coins and B be the event of getting an even number on the die.
Find $P(A)$, $P(B)$ and $P(A \cup B)$.

(*b*) How many 6 digit telephone numbers can be formed such that the first and second digits are 3 and 5 respectively and no digit is repeated?
How many of these telephone numbers end with an odd digit?

(*c*) There are 8 men and 10 women in a group. In how many ways can a committee be formed from this group, consisting of

(i) 5 men and 6 women?

(ii) 6 members with at least 3 men?

14. A box contains 3 green balls and 2 blue balls, which are identical except for colour. A ball is drawn at random from the box. If the ball drawn is green, 2 other blue balls are added to the box without replacing the ball drawn and, if the ball drawn is blue, 2 other green balls are added to the box without replacing the ball drawn. Now, a second ball is drawn at random. Find the probability that

(i) both balls drawn are green,

(ii) at least one of the balls drawn is green,

(iii) both balls drawn are green, given that one of the balls drawn is green,

(iv) the balls drawn are of different colours.

[*See page nine*

15. A continuous random variable Y follows an exponential distribution with probability density function $f(y)$ given as follows:

$$f(y)=\begin{cases}\lambda e^{-\lambda y}, & y>0\\ 0, & \text{otherwise}\end{cases}$$

where the parameter $\lambda>0$.

Find the mean, variance and the cumulative density function of Y.

Let the time taken by a doctor to treat a patient be exponentially distributed with a mean of 10 minutes. Find each of the following. (Answers need not be simplified.)

(i) The 50^{th} percentile of the time taken by the doctor to treat a patient.

(ii) The probability that the doctor takes more than 8 minutes to treat a patient.

(iii) If the doctor has already spent more than 10 minutes to treat a patient, the probability that he will finish treating this patient in less than 15 minutes.

16. (*a*) The following table gives the frequency distribution of the number of students who were absent for a class within a month.

No. of absent students	No. of days
1 – 3	15
4 – 6	12
7 – 9	10
10 – 12	5
13 – 15	2

Estimate the mean, mode and median of the distribution.

(*b*) The time spent by a barber to cut a customer's hair is normally distributed with a mean 20 minutes and a standard deviation of 5 minutes.

(i) Find the probability that the barber takes

(*a*) more than 25 minutes,

(*b*) a time between 25 and 30 minutes,

to cut a customer's hair.

(ii) Find the probability that he serves 5 customers in less than 2 hours (120 minutes).

[*See page ten*

17. The duration of activities of a project and the flow of activities are given in the following table:

Activity	Preceding Activity (Activities)	Duration (in months)
A	–	3
B	A	6
C	A	7
D	A	5
E	B, C	13
F	C, D	8
G	D, F	11
H	G, E	6
I	H	2

(i) Construct the project network.

(ii) Prepare an activity schedule that indicates earliest start time, earliest finish time, latest start time, latest finish time and float for each activity.

(iii) Find the total duration of the project.

(iv) Write down the critical path of the project.

(v) What are the activities that can be delayed without extending the duration of the project?

(vi) How is the project completion time affected by each of the following?

(*a*) Activity F is delayed by 2 months,

(*b*) Activity E is delayed by 1 month.

* * *

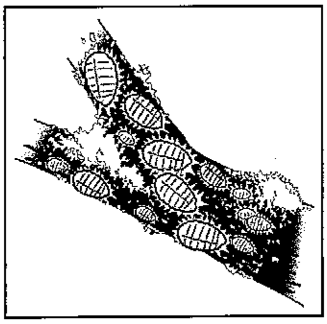
අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2021(2022)
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General Certificate of Education (Adv. Level) Examination, 2021(2022)

කෘෂි විද්‍යාව I விவசாய விஞ்ஞானம் I **Agricultural Science I**	**08 E I**	පැය දෙකයි இரண்டு மணித்தியாலம் *Two hours*

Instructions:

* *Answer **all** the questions.*
* *Write your **Index Number** in the space provided in the answer sheet.*
* *Instructions are given on the back of the answer sheet. Follow those carefully.*
* *In each of the questions* 1 *to* 50, *pick one of the alternatives from* (1), (2), (3), (4), (5) *which is **correct** or **most appropriate** and **mark your response on the answer sheet with a cross** (×) on the number of the correct option in accordance with the instructions given on the back of the answer sheet.*

● Use the following diagram to answer question number **01**.



1. The pest found in the above diagram can be identified as,
(1) thrips. (2) aphids. (3) white flies.
(4) mealy bugs. (5) plant hoppers.

2. Compound layering is most suitable for
(1) croton. (2) lemon. (3) jasmine. (4) begonia. (5) strawberry.

3. An activity comes under inter-cultivation practices would be,
(1) burning. (2) weeding.
(3) deep plowing. (4) levelling soil surface.
(5) chopping and incorporating crop residues into the field.

4. In agricultural lands,
(1) primary tillage is done before the land clearing.
(2) secondary tillage is done after crop establishment.
(3) seed bed preparation is done in between primary and secondary tillage.
(4) both primary and secondary tillage are done before the crop establishment.
(5) both secondary tillage and inter-cultivation are done after the crop establishment.

5. Tetrazolium test is done to determine seed
(1) purity. (2) viability. (3) dormancy.
(4) germination. (5) moisture content.

[*See page two*

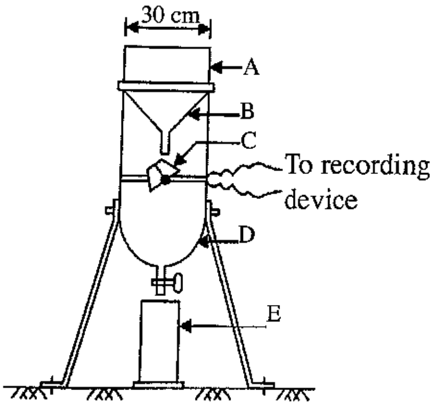
6. An example for a climacteric fruit is,
(1) mango. (2) grapes. (3) orange. (4) pineapple. (5) dragon fruit.

7. During a health check-up of a particular person, his Body Mass Index (BMI) was found to be 22.3. The body condition of this person can be categorized as,
(1) pre-obesity. (2) underweight. (3) obesity class I.
(4) obesity class II. (5) normal weight.

8. A newly born calf should be fed with colostrum for,
(1) one day. (2) two days. (3) three days.
(4) four days. (5) five days.

9. The international organization having its headquarters in Sri Lanka is,
(1) World Trade Organization (WTO).
(2) World Health Organization (WHO).
(3) Food and Agriculture Organization (FAO).
(4) International Rice Research Institute (IRRI).
(5) International Water Management Institute (IWMI).

- Following is a line drawing of a recording type rain gauge used in a school weather station. Use this diagram to answer question No. **10.**



10. In above diagram, the tipping bucket is denoted by,
(1) A. (2) B. (3) C. (4) D. (5) E.

11. The products of mechanical/physical weathering of rocks and minerals would be,
(1) clays. (2) bed rock. (3) smaller particles.
(4) primary minerals. (5) humic substances.

12. It is important to manage the excessive water in agricultural fields through a proper drainage system. Drainage in crop fields,
(1) controls the weed propagation.
(2) reduces the pH value in the soil.
(3) increases the aerobic bacterial activity in the soil.
(4) increases the amount of plant nutrients in the soil.
(5) decreases the rate of organic matter decomposition in the soil.

13. Major internal factors affecting seed germination are,
(1) moisture and temperature.
(2) seed dormancy and moisture.
(3) temperature and seed dormancy.
(4) seed dormancy and seed viability.
(5) seed viability and relative humidity.

[*See page three*

14. Monocotyledonous plants cannot be propagated by conventional vegetative propagation methods because they
(1) do not branch.
(2) are perennials.
(3) have no uniform cambium.
(4) have a fibrous root system.
(5) do not contain required plant hormones.

15. In plant breeding, the most common method of inducing polyploidy in plants is,
(1) use of Ethylene.
(2) use of Colchicine.
(3) use of mutagenic chemicals.
(4) exposure to ionizing irradiation.
(5) exposure to non-ionizing irradiation.

16. The most important soil environmental conditions that should be controlled in Controlled Environment Agriculture would be,
(1) soil pH, soil colour and soil depth.
(2) soil moisture, soil pH and soil colour.
(3) soil aeration, soil moisture and soil pH.
(4) soil pH, soil colour and soil temperature.
(5) soil aeration, soil depth and soil temperature.

17. In his home garden, a student observed an insect having following characteristics.
- Two pairs of wings.
- 2/3 of the fore wing is leathery while the tip is membranous.
- Hind wings are completely membranous.

The order of this insect would be,
(1) Hemiptera. (2) Coleoptera. (3) Homoptera.
(4) Orthoptera. (5) Thysanoptera.

18. The part of the knapsack sprayer that controls the pesticide flowing from the tank is,
(1) lance. (2) nozzle. (3) plunger rod.
(4) check valve. (5) cut-off valve.

19. Micronutrients consist in food are,
(1) water and minerals only.
(2) water and vitamins only.
(3) vitamins and minerals only.
(4) micro minerals and trace minerals only.
(5) fat-soluble and water-soluble vitamins only.

20. The instruments commonly used to measure maturity indices of fruits are,
(1) ruler, pH meter and brix meter.
(2) ruler, firmness tester and pH meter.
(3) firmness tester, pH meter and brix meter.
(4) weighing balance, brix meter and pH meter.
(5) firmness tester, ruler and weighing balance.

21. Average fat content of Friesian cow milk is,
(1) 2.5%. (2) 3.5%. (3) 4.5%. (4) 5.5%. (5) 6.5%.

[See page four

22. A person who works in a factory experiences extreme tiredness, headache and blur vision at the end of the day. The reason for this condition may be,
(1) his working environment is with lots of noise.
(2) he is working in a dusty environment inside the factory.
(3) he was exposed to extreme temperature in his working place.
(4) he is working with the vibrating machine the whole day.
(5) he doesn't consume adequate water while working in the factory.

23. A procedure that is followed in conservation agriculture for the nutrient conservation in an agricultural field would be,
(1) practice contour farming.
(2) use zero tillage in the field.
(3) add more fertilizer to the field.
(4) add organic materials to the field.
(5) introduce integrated pest management to the field.

24. Before commencing a hotel complex within the coastal zone, approval for the Environmental Impact Assessment Report should be obtained from,
(1) Coast Conservation Department.
(2) Department of Tourism.
(3) Ministry of Environment.
(4) Central Environmental Authority.
(5) Department of Forest Conservation.

25. A farmer observed that when he cultivates spinach in June, plants flower early compare to the spinach cultivated in December. This is mainly because spinach
(1) is a long day plant.
(2) is a short day plant.
(3) delays flowering in cooler climates.
(4) flowers early when light intensity is high.
(5) delays flowering under cloudy conditions.

26. Weathering of rocks and minerals would be intensified under,
(1) temperate climate.
(2) cold and dry climate.
(3) cold and rainy climate.
(4) warm and dry climate.
(5) warm and rainy climate.

27. If the evapotranspiration rate of a crop field is 7.5 mm/day and the moisture content in the soil at filed capacity is 84 mm, the most suitable irrigation interval for this crop field would be,
(1) 5 days. (2) 6 days. (3) 7 days. (4) 8 days. (5) 9 days.

28. One of the **disadvantages** of traditional water lifting methods is that,
(1) they are labour intensive.
(2) their initial capital investment is high.
(3) they can be used only for selected crops.
(4) their usage depends on the quality of water.
(5) they are heavily depend on non-renewable energy sources.

[*See page five*

29. In a particular cultivation technique, a very shallow stream of water containing all the dissolved nutrients required for plant growth is re-circulated passing the bare roots of plants in a watertight gully. This technique is best explained as,

(1) floating technique. (2) deep flow technique.
(3) root dipping technique. (4) nutrient film technique.
(5) capillary action technique.

30. An insect pest incidence in a crop field can easily be developed into epidemic level,

(1) if proper weeding is not done.
(2) when a mono crop is cultivated.
(3) when natural equilibrium is maintained.
(4) if only traditional varieties are cultivated.
(5) if natural enemies are available in the field.

31. Of the following statements, the correct statement regarding the selection of a suitable scion for grafting would be,

(1) scion should always be compatible with stock plant.
(2) the best time to take a scion is the shooting stage of the plant.
(3) scion should always be selected from the same species of the stock plant.
(4) scion should be taken from the mother plant before it reaches the maturity.
(5) scion should be selected from a mother plant having high resistance to soil-born diseases.

32. Pre-emergent herbicides are generally used,

(1) before land preparation.
(2) to kill already established weed plants.
(3) to destroy the weed seeds found in the crop field.
(4) only after the establishment of the crop in the field.
(5) to prevent germinated weed seedling from becoming established.

33. Kurunegala District has a high potential for animal husbandry. The type of animal husbandry that has the highest potential in this area would be,

(1) extensive goat farming. (2) intensive cattle farming.
(3) extensive cattle farming. (4) intensive poultry farming.
(5) extensive poultry farming.

34. The correct statement about a compacted or hardened soil is that,

(1) bulk density and porosity will be low.
(2) true density and porosity will be low.
(3) bulk density and true density will be high.
(4) porosity and water holding capacity will be low.
(5) bulk density and water holding capacity will be low.

35. Following are two statements related to the soil air.

A - Composition of soil air is different from the composition of atmospheric air.
B - Soil air is important for root growth and activity of microorganisms.

Of the above statements

(1) both A and B are correct.
(2) A is correct but B is incorrect.
(3) B is correct but A is incorrect.
(4) A is correct and it is further explained by B.
(5) B is correct and it is further explained by A.

[*See page six*

36. A free-living bacteria in soil that fixes nitrogen under aerobic condition is,
(1) *Azolla.* (2) *Anobaena.* (3) *Aspergillus.*
(4) *Azotobacter.* (5) *Azospirillum.*

37. Following are three statements related to the fertilizer use efficiency.
A - The availability of plant nutrients in soil, for absorption by plants, is affected by soil pH.
B - Fertilizer use efficiency can be increased by site specific fertilizer application.
C - Fertilizer use efficiency increases when the soil moisture level increases from field capacity to saturation level.
Of the above, the correct statement/s would be,
(1) A only. (2) B only. (3) C only.
(4) A and B only. (5) A and C only.

38. An element is to be considered as an essential nutrient when,
A - a plant cannot complete its life cycle without that element.
B - it is indirectly involved in the metabolic process of the plant.
C - the action of the element is specific, where no other element being able to substitute for it.
Of the above, the correct statement/s would be,
(1) A only. (2) B only. (3) A and B only.
(4) A and C only. (5) B and C only.

39. Following are some statements regarding propagation of plants through seeds.
A - Seedlings take a longer time to become a mature plant.
B - Impossible to obtain genetic uniformity.
C - Seeds are not available throughout the year.
Of the above, the correct statement/s would be,
(1) A only. (2) B only. (3) C only.
(4) A and B only. (5) A and C only.

40. A commonly used chemical for surface sterilization of an ex-plant is,
(1) sulfuric acid (H_2SO_4).
(2) hydrochloric acid (HCl).
(3) clorox (sodium hypochlorite)
(4) caustic soda (sodium hydroxide)
(5) caustic potash (potassium hydroxide).

41. The worst combination of climatic factors that can reduce the egg production of hens in an ordinary deep litter house would be,
(1) heavy rains and wind.
(2) hot and windy climate.
(3) alternative cold and hot climate.
(4) continuous hot and humid climate.
(5) short day length and intermittent hot climate.

42. Few examples for concentrate feeds are,
(1) soybean meal, fish meal and maize silage.
(2) coconut poonac, maize grains and rice bran.
(3) fresh grass, maize silage and coconut poonac.
(4) maize grains, ground dried grass and chopped hay.
(5) rice bran, wheat bran and chopped sugar cane tops.

[*See page seven*

43. Following are some statements regarding poultry keeping.

A - Broiler birds are usually reared intensively.

B - Natural hatching of eggs is more successful than artificial hatching.

C - Compared to grower feed, layer feed should contain more protein.

D - In order to produce eggs, a commercial layer farm should have both hens and cockerels.

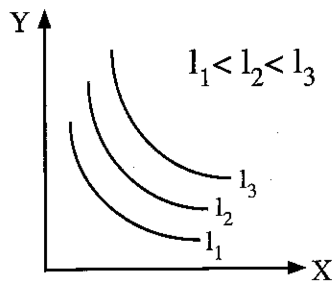
Of the above, the correct statement/s would be,

(1) A and B only. (2) A and C only. (3) B and C only.
(4) B and D only. (5) C and D only.

44. A farmer having 100 cows, instructed his milkers to complete the milking of each and every cow within 6 minutes after commencing milking. The most valid reason for the above instruction is,

(1) to have sufficient time to milk all the cows.
(2) to avoid any stress to cows due to milking for a longer time.
(3) that prolactin secretion stops in 6 minutes after stimulation.
(4) to reduce contamination of milk due to longer exposure time.
(5) that oxytocin hormone is active only for 6 minutes after secretion.

- Use the following graph to answer question no. **45.**



45. In the above graph, X and Y would be, respectively

(1) bread and buns.
(2) labour and capital.
(3) production and cost.
(4) bread and buns or labour and capital.
(5) labour and capital or production and cost.

46. In general, demand curves are downward-sloping since each additional unit of a good is put towards a less usable value. This phenomenon can be best explained by,

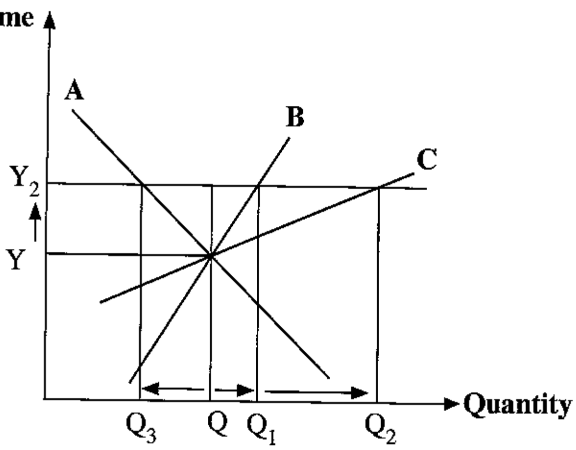
(1) the law of supply.
(2) the law of demand.
(3) the law of diminishing productivity.
(4) the law of diminishing marginal utility.
(5) the law of increasing opportunity cost.

47. A newspaper reports, "Seed Monopoly Broken into Several Competing Firms." If this statement is true, it is expected that the seed producing industry to,

(1) increase both output and price.
(2) decrease both output and price.
(3) increase output and decrease price.
(4) decrease output and increase price.
(5) increase the output without changing the price.

[*See page eight*

- Use following graph to answer question no. **48**.



48. In the above graph, the demand curves A, B and C represent,
(1) luxury good, inferior good and normal good respectively.
(2) inferior good, luxury good and normal good respectively.
(3) inferior good, normal good and luxury good respectively.
(4) normal good, inferior good and luxury good respectively.
(5) luxury good, normal good and inferior good respectively.

49. The price of goods would be the key factor when competing in,
(1) duopoly. (2) oligopoly.
(3) monopoly. (4) perfect competition.
(5) monopolistic competition.

50. The following are statements regarding the rainfed agriculture.
A - High risk and uncertainty due to unavailability of irrigation water.
B - Low input method that can be used with very low capital investment.
C - Use the rainfall as the water supply and therefore no requirement for irrigation.
Of the above, the correct statement/s would be,
(1) A only. (2) A and B only. (3) A and C only.
(4) B and C only. (5) All A, B and C.

* * *